LIFE-STAGES IN ETHNOZOOLOGY, A POLYNESIAN EXAMPLE

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It is a familiar enough idea that a language may provide different terms for the different developmental stages in the life-history of particular animals. The English language offers many instances of juvenile/adult contrasts in animal naming. In some cases the term applied to a juvenile is a simple diminutive of the adult term (e.g., piglet→pig, codling→cod) or a diminutive derived from an earlier or alternative root (e.g., kitten→cat, cygnet→swan). Yet other terms for young animals have long histories of independence from the corresponding adult terms (e.g., foal→horse, lamb→sheep). There are also longer life-stage sequences such as that of the salmon (alevin→parr→smolt→grilse→salmon).

Anthropologists and linguists have long been aware of comparable sequences in the languages of other societies. Boas (1916:146), in the same place that he made the much-repeated comment on the number of Eskimo words for snow, remarked on the different Eskimo names for the life-stages of seals. But, despite (or possibly because of) their familiarity, life-stages have remained relatively little discussed in the ethnozoological literature. In this paper I shall be examining life-stages as they are presented in the language and ethnozoology of one Polynesian society, that of Mangaia, second largest and most southerly of the Cook Islands. In doing so I hope to indicate the relevance of life-stages to some central issues in the study of "folk" zoology and the need to achieve a better understanding of their interconnection with the "taxonomic" categories more usually considered.

Life-stage Terminology: Structure and Usage

There are two basic patterns of terminology involving life-stages. In the first of these, one term is applied in general to a given organism while a quite distinct set of life-stage names is applied to the organism at different periods of its development (e.g., there is a fish named 'X' which has life-stages termed 'P', 'Q', 'R'). In the second pattern there is no separate superordinate term but only those of the life-stage sequence (e.g., there is a fish named 'P', 'Q', 'R' at different stages in its life-history). Anderson (1972:77) has drawn attention to this distinction in contrasting the terminology he recorded among the Boat People of Hong Kong, a fish terminology with superordinate general terms, with Tahitian terminology, which has life-stage terms only. Unsurprisingly, Mangaian, a Tahitic language, follows the same pattern as Tahitian.

However, to say that Mangaian (or, for that matter, Tahitian) *only* has life-stage names is misleading. There are what might be called "dominant terms" within sequences of life-stage names which are used in certain contexts as superordinate general terms. For instance, in the Mangaian sequence encompassing a number of trevallies (fish of the family Carangidae) — *riporipo→riporipo titiara→titiara→urua* — it is the term *titiara* which has prominence. Asked to "tell me all the fish (*mangaika*) you know", informants often included *titiara* in their verbal lists, later revealing the terms *riporipo* and *urua* when asked to discuss the *titiara*. Similarly the term *pa'oro* almost always appeared in informants' catalogues of familiar fish, but I only learned that the juveniles of these wrasses were termed *ngorengore* when I began the identification of specimens. In Berlin, Breedlove and Raven's terms, *titiara* and *pa'oro* would both be labels for folk generic taxa. But they are also life-stage labels. We see, then, a pattern of the form:— there is a fish named 'R' which has life-stages termed 'P', 'Q', and 'R' — the superordinate general term doubling as a life-stage term (though not necessarily as the final term in the life-stage sequence). This does not strictly constitute a case of polysemy, with a particular lexeme assuming two discrete senses, but rather of semantic (and consequent distributional) marking (Lyons 1977).

Perhaps this may be clarified a little by considering a simple English example, let us say *cygnet→swan*. *Swan* is clearly the superordinate term. To say "There are swans on the lake" does not commit me as to whether or not there are cygnets. But *swan* and *cygnet* may be in contrast. "Was it a swan or a cygnet?" is a perfectly sensible question. English speakers understand that a cygnet may be said both to *be* a swan and to *become* a swan, without any real sense of contradiction. We also find that, while "a cygnet is a young/immature swan" is an unexceptionable statement, "a swan is an old/mature cygnet" is distinctly odd. Again "juvenile swan" and "adult swan" are acceptable collocations while "juvenile cygnet" and "adult cygnet" are respectively a tautology and a contradiction. Evidently *cygnet* is more specific in its sense than *swan;* that is, it is semantically marked with respect to *swan*. But, as Lyons (1977:308) has observed, "whether a lexeme is semantically unmarked or not is a matter of degree". I would not claim that *swan* is completely unmarked in relation to *cygnet*. Is one likely to refer to a group of cygnets as "those swans"? There is also something unsatisfactory about the sentence "That swan is a cygnet".

If, even in such a relatively uncomplicated case of juvenile/adult generic distinction as *cygnet→swan,* one must talk in terms of the relative unmarkedness of *swan,* comparable or greater subtleties or marking must be expected in connection with more complex life-staging of the kind that occurs in Mangaia. A full consideration of this aspect of Mangaian life-stage terminology would obviously require a detailed examination of the acceptable and unacceptable collocations of life-stage terms and a thorough investigation of the relevant linguistic contexts. My studies having an ethnozoological rather than a linguistic orientation, I can make only a few broad points.

Firstly, there is the obvious point that some life-stage terms (those I have called "dominant terms") occur much more frequently in general conversation than others. As indicated, they function as "folk generics" in the Berlin, Breedlove and Raven sense, and as such are found in a wider range of speaking contexts, the verbal list being the most apparent from my point of view. These were the terms that I learned first, and there are indications in the data collected that they are also the terms learned first by Mangaians. To find a Mangaian approaching adulthood who did not know the fishes *pa'oro* and *titiara* would be unusual. But to find one unaware that the juvenile *pa'oro* was a *ngorengore* or that the *kiko muri* was the next stage of the *titiara*'s growth would not be surprising. It is quite possible that a full knowledge of life-stage terminology will never be developed. Since the majority of life-stage sequences relate to fish and the most extensive fishing activities are those of adult male Mangaians, it is to the older men that one must look for the most extensive life-stage terminologies.

There is, I believe, an association between the pattern of learning and asymmetries in the definition or explanation of different life-stage terms. There is a tendency for nondominant terms to be clarified in relation to a dominant term, but not the reverse. Several times, when asking "What is a *ngorengore*?", I was told "It is a small *pa'oro* (*pa'oro rikiriki*)". The question "What is a *pa'oro*?" never had the response "It is a large *ngorengore*". This kind of example could be multiplied. Consider why it is that, in English, one is unlikely to explain "A swan is a grown-up cygnet". It is not so much that "grown-up cygnet" embodies a contradiction as that we are aware that the sentence is unlikely to convey any information. Explanation or definition must proceed from the known to the unknown. But we have the expectation that anyone who knows the meaning of *cygnet* will already know the meaning of *swan*. If someone does not know what a swan is we would normally assume that they could not possibly know what a cygnet is, and to try and define the former in terms of the latter is blatantly self-defeating. Similarly, a Mangaian would conclude that anyone ignorant enough about fish not to know what a *pa'oro* is would be equally uninformed about a *ngorengore*. It is tempting to assume that, because of the greater variety in the contexts of use, the more unmarked a term (lexeme) is in relation to others in a set, the more likely it is to be the first learned.

But that is to overlook learning by ostension. This process is clearly of great importance in the learning of animal terminology in an environment such as Mangaia, where human and animal worlds remain in close contact. I have, on a number of occasions, heard Mangaian children being introduced to a new animal name as a result of their failure to identify, or misidentification of, an actual specimen. In the adult identification of specimens the shorthand of the dominant life-stage term tends to be abandoned in favour of a more detailed distinction of life-stages. Unfortunately, I do not have the data to determine whether this tendency is upheld when making identifications to young children. (Our own inclinations in this respect are not entirely consistent. We would probably be quite happy to speak to a young child of "little lambs" and "puppy dogs" but would be more likely to talk of a "baby swan" rather than a "cygnet".) In fact, even if life-stages are specified in early experiences of animals it is still likely that the dominant life-stage term will be the one most often heard. For the majority of animals for which there is a distinctive life-stage terminology, a child's initial experience of them will not be in the wild (or in the water as it would be in most cases) but rather when the creatures are brought to shore or back to the village as food. Since dominant life-stage terms generally relate to a developmental stage occupying the middle ground in an organism's life history (i.e., not just to small juveniles, which would be unimportant or only seasonally important as food, and not just to desirable but rare very large, mature individuals), they are applied regularly to many of the creatures brought home for consumption. A child would be repeatedly exposed to these terms in early learning by ostension and this form of learning would, then, also favour their early acquisition.

But, having said all this concerning dominant life-stage terms, it must be admitted that not every sequence has a single term which can unequivocally be called dominant. There are evident gradations in the extent to which different terms can be said to be unmarked with respect to each other. For instance, in the rudderfish sequence:

raupipi→tiotio→tiotio nanue→nanue

nanue has the best claim to dominance; but *tiotio* also sometimes cuts adrift from its specific life-stage sense. Indeed, I have occasionally heard it used instead of *nanue* in the verbal listing of familiar fish. There are also a number of debated sequences. That is to say, there were disagreements among informants as to whether the named units involved were in fact life-stages or whether they were distinct organisms. An example of such a sequence would be:

koperu→au'opu→a'ai otava

which brings together mackerel scads, bonito and tuna. Even those who hold that certain very general physical similarities between these fishes show them to be developmentally related tend to list *koperu, au'opu* and *a'ai otava* separately. There is nothing in usage to suggest marking differences. The first two terms function as "generics" in Berlin's sense, the third being a "specific". It is worth noting that each of the fish involved is an important catch in its own right, and that in no way could any one of the supposed life-stage names be applied to specimens of the other two (except for a remote possibility of confusion between large bonito, *au'opu,* and small tuna, *a'ai*). Identifications of food fish in the presence of children are not likely to favour the early acquisition of any one of the terms in advance of the others. (In early learning the tuna would be identified generally as *a'ai*. It is principally fishermen who are concerned to distinguish the yellowfin tuna, *a'ai otava*.)

Looking at the sequences of life-stage terms in more detail, a number of regularities are apparent. Firstly, in approximately 25 percent of the recorded sequences there is an example of a term being preceded by its diminutive — the Mangaian diminutives being formed by the full or partial reduplication of the root word. So, the life-stage sequence for unicorn-fishes is:

umeume→ume

while in the sequence for brown-spotted groupers (spp. of Serranidae) we find:

karakarau→karau

In a few instances a term is preceded by some otherwise qualified version of itself. For instance, in the sequence for black trevally we see:

pararu'i→ru'i

in which context *para* may suggest something like 'small pieces', while for conger eels there are the life-stages:

toketoke pu'i→pu'i

Toketoke, in present-day Mangaian meaning 'worm' is said to relate to the worm-like slimness of the pearlfishes which are believed to be juvenile eels. (But since **toke* may well have been a Proto-Polynesian eel term, the evolution of *toketoke pu'i* might have been rather different from that suggested by folk etymology.)

I recorded only one case of life-stage terms being derived by descriptive qualification of a predecessor in the sequence. The full sequence for black trevally is:

pararu'i→ru'i→ru'i kai'ara→ru'i urua

kai'ara implying something elongated but strong, and *urua* being the ultimate growth stage of the trevally *titiara,* which is regarded as being similar and closely related to the *ru'i*. *'Ru'i'* is, of course, the dominant life-stage term in this sequence. The last two terms are used only by a small group of experienced fishermen.

More common is the combination of two life-stage terms to indicate an intermediate stage, as in the lunar-tailed rock cod sequence:

taratara→taratara oka→oka

or the bait goatfish sequence:

koama→koama vete→vete

Yet, these compound life-stage terms are, in a sense, the most insubstantial features of the terminology. Some informants consistently omitted them in their accounts of life-stage sequences. They are also hardly ever used in discussion of fishing techniques and practices. But in the identification of specimens they appeared regularly. Mangaian fishermen have fairly clear ideas as to the typical size of the members of particular life-stages, and will indicate such sizes by marking them off on one arm with the fingers of the opposite hand. A compound intermediate life-stage term is applied when it is felt that a particular specimen deviates too far from the typical sizes of either of the bordering life-stages to be assigned to one or the other of them. These intermediate life-stages appear to be, as much as anything else, a reflection of the difficulties encountered in cutting up a developmental continuum. It is interesting to note that a similar pattern of terminology has emerged in Mangaian ethnobotany, in the development sequence of the coconut, which may be given as:

pati→koua→niata kokoua→niata→kokomoto→komoto→'akari maro→tupu

with *niata kokoua* standing for an intermediate stage between *niata* (a fully grown but green nut) and *koua* (a nut of fist size or a little more).

However, the bulk of Mangaian life-stage terms are simple primary lexemes — *pio, koriaria, ka'o, piriri,* etc. On labelling criteria, then, most life-stages, not just those denoted by dominant life-stage terms, resemble Berlin's folk generics (which are characteristically labelled by primary lexemes). With three exceptions, the sequences I recorded may be said to relate to the generic level. That is, at least one generic name will appear as a life-stage name and if such a generic can be subdivided into "folk species" the life-stage sequence will apply to all of them. So, the surgeon-fish sequence:

pio→papara'a→para'a→'api

is applicable to *'api tako, 'api va'avere, 'api taringa auika, 'api 'uku tea,* etc. The secondary lexemes labelling the finer "folk specific" categories are generally formed by the descriptive qualification of a dominant life-stage (=generic) term (for instance 'black *'api*', 'pouting-mouth *'api*', 'blue-eared *'api*', 'white-tailed *'api*' in the examples just given). In some cases the same descriptive qualification can be applied to other terms in a sequence. For grey mullet the given sequence is:

koriaria→auaaua→aua→aua kanae→kanae

kanae is the dominant term and the sequence is applicable to both *kanae va'a roa* (=long-mouthed *kanae*) and to *kanae va'a poto* (=short-mouthed *kanae*). But, in specifying their catches and identifying specimens, fishermen also spoke of *'aua va'a roa'* and *'aua va'a poto'*. Whether such a "specific" differentiation cutting across more than one life-stage will occur depends, in part at least, on the degree to which the features on which the differentiation is based are observable in each stage. In the case cited the relative elongation of the head characterising *kanae va'a roa* is also apparent in the *aua*.

Shortage of detailed published data on life-stages, for the moment, limits comment on the parallels between Mangaian life-stage terminology and that found in other Oceanic languages. However, the Hawaiian fish sequences given by Titcomb (with Pukui 1972) do make an interesting comparison. Since Mangaian and Hawaiian have both developed from Proto-Central Eastern Polynesian within the last millennium and a half, there must be a reasonably high expectation of cognate terms. In fact, only two of the 17 full sequences given by Titcomb provide more than a single cognate for a Mangaian term (the mean number of terms in a sequence being approximately three for each language). These are the goatfish sequence:

Hawaiian *oama→weke* (Titcomb 1972:162)

Mangaian *koama→vete* (with the intermediate *koama vete*)

and the threadfin sequence:

Hawaiian *moi li'i→pala moi→moi* (Titcomb 1972:110)

Mangaian *para moi→moi*

In nine other sequences there are single cognate terms. In eight of these cases the Hawaiian term is cognate with a Mangaian dominant life-stage (=generic) term (albeit sometimes having the reduplicated form which would be read in Mangaian as a diminutive). For instance, compare the scad sequences:

Hawaiian *Pa'a'a→halalu→akule* (Titcomb 1972:62)

Mangaian *Ature→orare*

or the goatfish (*Parupeneus* spp.) sequences:

Hawaiian *makolokolopao→ahuluhulu→kumu a'e→kumu* (Titcomb 1972:91)

Mangaian *ka'uru'uru→ka'uru→a'uru*

But while matching of generics is relatively common, the great majority of Hawaiian fish life-stage terms are not cognate with those of Mangaia. Discounting two Hawaiian sequences relating to fishes of types probably not known in Mangaian waters, this leaves 15 sequences in which there are 10 terms cognate with Mangaian dominant life-stage (=generic) terms, only three cognate with other Mangaian life-stage terms, leaving a further 28 Hawaiian terms.

Although it is dangerous to speculate on such limited information, this does seem to suggest: either

- (a) that life-stage terminology was poorly developed in Proto-Central Polynesian, from which both languages have developed, and that, consequently, they had little common heritage of life-stage terms; or
- (b) that life-stage terms may be considerably more unstable and liable to replacement that other portions of the ethnozoological lexicon, particularly generic terms.

Other fragments of information do little to disturb such a view. For instance, looking at sequences for grey mullet:

- Mangaian *koriaria→auaaua→aua→aua kanae→kanae*
- Tuamotu *kavata→kanae* (Bagnis, Mazellier, and Christian 1972:267)
- Hawaiian *po'ola→kahaha→'ama'ama→'anae* (Titcomb 1972:64)
- Tongan *te'e kona→te'efo→unomoa→fua→kanahe* (Barnett 1978:58)

we see the very clear set of generic cognates (*kanae, 'anae, kanahe*) and a singular lack of cognates among the other terms, not only between the Tongan terms and those of the Eastern Polynesian languages but also between the terms of the different members of the Eastern grouping. But whether this diversity of names is the result of the late appearance of life-stage terms in the development of the Polynesian languages or of their inherent instability (possibly connected with their being more specialised and not as familiar to the community as a whole as generics) it is impossible to assess without further widespread investigation into the forms of such terminology.

The Distribution of Mangaian Life-stage Sequences

In the Mangaian case it is obvious that distinctive life-stage terminology, though not restricted to any particular animal group, does not occur with the same frequency for all groups. The vast majority of life-stage sequences recorded relate to fish. This is evidently more than a reflection of the large number of fish taxa recognised. For the creatures seen as belonging to, or marginal to, the broad 'fish' (fish + cetacean + turtle) category (*mangaika*), I recorded 97 single lexeme terms which would, in the scheme of Berlin, Breedlove, and Raven (1973), be seen as labelling generic level taxa. This compares with 117 such terms for animals of other groups. However, I recorded 34 distinct 'fish' life-stage sequences to be compared with a maximum of only seven (if some insect metamorphoses are included) among other animals. Reports of life-stage naming from other Pacific languages predominantly relate to fish terminology (Akimichi 1978, Barnett 1978, Titcomb 1972). But the lack of full ethnozoological records prevents detailed comparison of life-stage distributions. I shall, then, consider the Mangaian distribution in some detail.

For the Mangaians, birds and larger land animals (with the exception of crabs) are the core members of the category *manu* (a life-form taxon in Berlin, Breedlove, and Raven's terms). For none of these creatures did I find a unique life-stage terminology. Their juveniles are specified by the use of the terms *'unu'unu* or *punua* in association with the generic name — so, *puaka*=pig, *punua puaka*=piglet; *moa*=fowl, *'unu'unu moa*=chick. These two "juvenile" terms appear to be interchangeable. Neither is applicable, other than metaphorically, to human children (*tamariki*). Some informants maintained that whereas *'unu'unu* is truly a Mangaian word, *punua* comes from the dialect of neighbouring Rarotonga. Their comments agree with the entry in Christian's (1924:24) "Vocabulary of the Mangaian Language": "*'Unu'unu* (*'unü 'ünü*) n. the young of animals. Rarotongan: punua."

The two "juvenile" terms may be used to refer to the young of other animal groups, and may, indeed, be used to explain the relationship between some named life-stages. For instance, I was told that the nymphal louse, *kari take,* was the *'unu'unu kutu,* that is, the young of the adult louse, *kutu*. Similarly, it was suggested that the bonito, *au'opu,* was the *punua* of the tuna, *a'ai*. However, within my limited experience of Mangaian usage, it does appear that *punua* and *'unu'unu* are applied most frequently and consistently to young animals which have some observable, prolonged relationship with their parents. I rarely heard *punua, 'unu'unu,* or the 'female parent (animal)' term, *tinana,* applied to fish, among which young and parents tend to go their own ways. It is possible that *punua* and *'unu'unu* carry some connotation of 'offspring in the care of a parent'. But I could not draw my informants to make any clear decision on this point, and to assume such a connotation may simply be to restate the fact that these terms are most frequently applied to birds and mammals, those creatures showing the most evident parental care. The case is complicated by the fact that the animals for which the juvenile terms are most often used in general conversation, the domesticates (pigs, goats, cattle, chickens, dogs, cats, horses), are all comparatively recent introductions. They have come to Mangaia in the last century and a half. It might, reasonably, be argued that the terminology applied to them, with its use of "juvenile" terms, is a reflection of their newcomer status rather than of any behavioural or other characteristics. Further comparative data will also be needed to clarify this point.

In fact, all the nonfish life-stage sequences recorded on Mangaia relate to invertebrates: crustaceans, insects, and one mollusc. Before looking at the seven widely agreed upon invertebrate examples, it may be helpful to an understanding of the reasoning behind some life-stage sequences to consider a crustacean sequence which, proposed by one informant, was universally rejected by others. This is the land crab/shore crab sequence:

karai'i→papaka

Most Mangaians regard *karai'i* (?*Cyclograpsus* sp.) and *papaka* (*Pachygrapsus* sp.) as two distinct types of crab. Yet, there are considerable morphological similarities between them. Furthermore, the *karai'i* never attains the size of the fully-grown *papaka,* and is seen rather more often than the small *papaka*. That it might, then, be regarded as an early life-stage of the bigger crab is not entirely surprising. Though the sequence is generally rejected, the zoological situation and the underlying assumptions of its proponent reflect those applying to other life-stage sequences incorporating more than one scientific species.

Firstly, the members of a species A are similar in a number of points of morphology to the members of a second species, B. (For simplicity's sake I shall speak in terms of two species, though there are Mangaian sequences which involve more than two.) They do not grow to the size attained by members of species B and are more plentiful and more familiar than the true juveniles of species B. The members of species A are then incorporated as juveniles into a single life-stage sequence with B. There is an assumption of developmental transformations connecting the forms A and B. Incorporation of two species into a single sequence is most tenable, and the resulting sequence most widely accepted when:

- (a) The true juveniles of the larger species (B) are rarely, if ever, encountered (as is the case with some fish). In the expected developmental size range of the particular organism a "size gap" then exists to be filled by the smaller species (A).
- *or*
- The individuals of A and the true juveniles of B are very similar in appearance and behaviour. Both may then be included in the life-stage sequence under the same term.
- (b) The assumed physical changes in the supposed development from A to B are at a minimum. In other words, the morphological similarities between A and (adult) B are at a maximum.

The lack of general acceptance for the *karai'i→papaka* sequence can be understood in relation to condition (a). First, *karai'i,* though very similar in form to the younger *papaka,* differ markedly in colour, being a dark purple-brown rather than a pale brown-grey. They also habitually feed and live further from the shore than the *papaka*. Given a great rarity of true *papaka* juveniles, these differences might be discounted in establishing a life-stage sequence. Mangaians are willing to acknowledge considerable differences in coloration and behaviour between successive life-stages. (They have the example of a number of fish species, such as certain surgeon-fishes, Acanthuridae, which do, indeed, undergo quite dramatic colour changes during their development.) However, the smaller *papaka* cannot really be said to be uncommon. Over a comparatively short period of time, the observations of a normally active Mangaian would reveal a full range of *papaka* sizes (in its postlarval shore-dwelling form), including that section overlapping with the size range of *karai'i*. There is therefore no "size gap" to be filled.

With the hermit and robber crabs (Paguridea and Coenobitoidea) one finds that most Mangaians make little attempt to differentiate crab types below a certain minimal size (between 5 and 10 cm in length). The small crabs of several species which are found in vast numbers in the shoreline pools and lagoon shallows are all referred to as *ungaunga* or possibly *kakara,* though the latter term may be reserved for the slightly larger hermits living on the coastal strip. There is a large overall range of sizes and habitats, from the minute hermits living in the rock pools to the disturbingly large coconut robber crabs (*Birgus latro*) which may be found in burrows or foraging for nuts more than a mile inland. The observed size gradient may be expressed in terms of a life-stage sequence. Commonly given forms of the hermit crab sequence are:

ungaunga→kakara→unga

or

ungaunga→unga

(The first form is more likely to be used in connection with land hermits.) Many informants were aware that not all *ungaunga* would become *unga,* some remaining small. Yet, with the failure (or lack of concern) to distinguish between types of *ungaunga,* there was far from perfect agreement as to which would undergo a development to *unga*. Several proposed sequences of specimens incorporated more than one scientific species. Here, then, a whole group of animals can be conveniently divided up by reference to life-stage terms which have implications as to size and habitat. Whether a particular crab type's life-history can be traced in terms of particular examples of each life-stage is of secondary consideration.

Long-armed prawns provide a rather simpler case, in which the life-stage sequence seems to reflect developmental, and possibly sexual, differentiation within a single *Macrobrachium* species. For Mangaia's commonest sizeable freshwater crustacean the given sequence is:

koura vai→tiaka

Tiaka are larger, darker, and have more massively developed claw arms than the *koura vai* stage. Prawns may be used both for food and fish bait, though not now of major importance in either role.

My data on octopus specimens are insufficient to establish the relationship between life-stages and scientific species in the sequence:

turi'eke→'eke

However, informants did indicate that it would be difficult to distinguish between octopus types (e.g., *'eke purenu, 'eke maori, 'eke taevao*) at the *turi 'eke* stage. As in many instances, the whole sequence is pitched at the generic level, refinement in terms of specifics only being possible or practically relevant at the later stage. Octopuses are taken in both men's and women's fishing. They are among the largest nonfish seafood animals. Again we have a broad observable size range.

I am not certain to what extent the three insect metamorphoses:

- *ro'ero'e→namu* mosquito larva→mosquito
- *moko→('ua pepe)→pepe* caterpillar→(chrysalis)→butterfly or moth
- *iro→rango* maggot/wasp or bee larva→fly/wasp or bee

should be regarded as equivalent to other life-stage sequences. The transformations indicated are much greater than for any other case. Furthermore, there is no regular gradient of size increase, a feature of all other Mangaian life-stage sequences. Although many informants were aware of the metamorphoses involved, they would not express the larva/imago relationships in quite the same terms as applied to the bulk of life-stages. The usual early stage/later stage size contrast, *me rikiriki/me ngangao* (when little/when big) was seen as inappropriate, and doubts were expressed as to the appropriateness of the *me 'ou/me pakari* (when young/when old) contrast. In verbal listing of known animals *moko* (caterpillar) and *pepe* (butterfly or moth) often appeared independently. An informant might list several types of each without having clear ideas about the relationships of development between them.

Experiencing the animal world in the light of my own folk-zoological tradition, I have the feeling that the contrasts between chick and adult bird and between caterpillar and butterfly or maggot and fly are qualitatively different. I believe that the statements of my Mangaian informants also indicate something of this feeling. However, it must be remembered that present-day Mangaian attitudes to insect metamorphoses may have been formed under the influence of Western zoology disseminated through schools and public health campaigns. For obvious reasons, public health teaching has tended to dwell upon the role of insects as disease vectors, and the possibility of control. To this end, much emphasis has been put on the relation between flies and mosquitoes and their larvae. House compounds are inspected for possible mosquito breeding places. This can hardly have failed to have had some influence upon Mangaian thinking about insect development. Whether to reinforce previous beliefs or to establish new ones, it is now impossible to say.

Still, there is one account of an insect's development which is regarded very much as other life-stage sequences and may well pre-date Western influence. Its constituent terms were recorded in their present meanings in Christian's vocabulary of 1920. The sequence is that of the human louse (*Pediculus humanus*). This is given as:

ri'a→kari take→kutu

where *ri'a* is the nit, *kari take* the relatively round-bodied nymphal louse, and *kutu* the more elongated mature louse. Through close personal contact, lice have probably been subjected to greater scrutiny than any other insect on the island. They become the focus of attention in the activity of delousing. In the absence of such sequences for other insects undergoing a similar development, it is probable that the existence of a louse life-stage sequence is largely a product of this greater attention and regular observation. Insects as a whole are of passing importance to Mangaians. Most may be dismissed as of no practical use or value (*puapinga kore*). They receive attention mainly when they impinge upon human activities as pests.

Fish, on the other hand, remain a major food resource and are of abiding interest to most Mangaians, particularly the men. Fishing is a highly popular activity, in itself preferable to agricultural work. Discussions of fish and fishing can be detailed and lengthy. An attentive listener and observer could not be unaware for long of the considerable number of life-stage sequences which form part of the Mangaian description of the fish world. (A full listing of fish sequences is given as an appendix.)

There are life-stage sequences relating to ocean, reef, lagoon, and freshwater species. These, therefore, include both fish taken in men's fishing (*tautai tane*) which involves a large range of techniques including canoe-fishing in the open sea, and those taken in women's fishing (*tautai va'ine*), which is heavily oriented towards the taking of invertebrates and is carried out on and within the reef ridge. The normal life-stage sequence represents a progression from small to large. So, it is not, perhaps, surprising that the Mangaians have not produced sequences for types of fish which remain relatively small, such as the blennies (*panako*) or the pomacentrids (*o'u* and *katoti*). For none of the sequences recorded is the expected length of the fish at full development less than 20 cm. In most cases the expected maximum length is considerably in excess of this, ranging up to 3 m (with a median value of around 50 cm). Yet a very large ultimate size is no guarantee that a life-stage terminology exists. For instance, I recorded no such terminology for whales or sharks.

Some sequences do, indeed, chart considerable changes in appearance and behaviour. Whereas the *pio* of the surgeon-fish sequence:

pio→papara'a→para'a→'api

is a tiny, almost transparent fish found in vast wandering shoals in February and March, the mature dark surgeon-fish, *'api* (*Ctenochaetus* and *Acanthurus* spp.), is black-brown in colour, up to 30 cm in length, and linked to a particular territory. Yet such obvious changes within the course of the sequence of development are by no means always the case. The transformations may be subtle and gradual, younger and older fish closely resembling each other in colouring and morphology. To distinguish between life-stages may require studied judgments in terms of relative typical sizes. Individuals' scales may vary somewhat. For a particular trevally specimen, one man's *riporipo* might be another's *titiara,* while a third applied the compound intermediate term *riporipo titiara*. (Even with our own simple life-stage sequences, we are aware that not all stages have clear biological mark-off points.) The distribution of Mangaian fish sequences clearly cannot be accounted for simply in terms of the extent of developmental transformations within different species.

What is also quite clear is that, with one or two marginal cases, all the fish life-stage sequences I recorded involve species which are common catches and/or regularly sought after as food. This is even more apparent when one looks at the longest sequences (those with three or more terms) all of which relate to much-taken food fishes such as rudder-fish, mullet, surmullet, groupers, trevallies and tuna. This strongly suggests that to understand the origin and distribution of fish life-stage sequences it would be necessary to understand how the life-stage terminology relates to fishing/food-gathering activity. This question will be returned to later.

Mangaian Interpretation of Life-stage Sequences

With the possible exception of the insect metamorphoses referred to above, Mangaians conceive of their biological life-stage sequences simply in terms of growth and development — that is, in terms of a single entity altering in appearance and behaviour over time. These are not species transformations of the kind that Dwyer (1976) has described for Rofaifo "folk zoology", with one organism metamorphosing into another. Here only one "folk organism" is involved. A close comparison can be made with the interpretation of fish development made in Rangiroa, in the Tuamotu group of French Polynesia (Ottino and Plessis 1972:363):

> Il faut insister sur la conception transformiste; les Paumotu ne considèrent pas (ou avec quelques restrictions pas forcement) que les poissons désignés sous les noms distincts soient des poissons différents. Ils savent parfaitement que l'un au moins des deux *tapiro* qu'ils reconnaissent . . . ne sont qu'un seul et même poisson; la "vieille verte" ou *Cheilinus undulatus* des classifications scientifiques, "de la même manière" que (par *Selar crumenopthalmus*) "le *ature* est l'enfant et l'adolescent" (*tamaiti et taure'are'a*), le *aramea* est l'adulte (*ta'ata pa'ari*) et le *orare* le vieillard (*ru'au*).

None of my Mangaian informants indulged in such complete comparison between animal life-stages and human development, though, on inquiry, several found it an acceptable metaphor. They did, however, often make use of the expressions *me 'ou* 'when young' and *me pakari* 'when old/mature' in explaining relations between successive stages.

In explaining the interconnections of a complete sequence the people of Rangiroa use the language of genealogy:

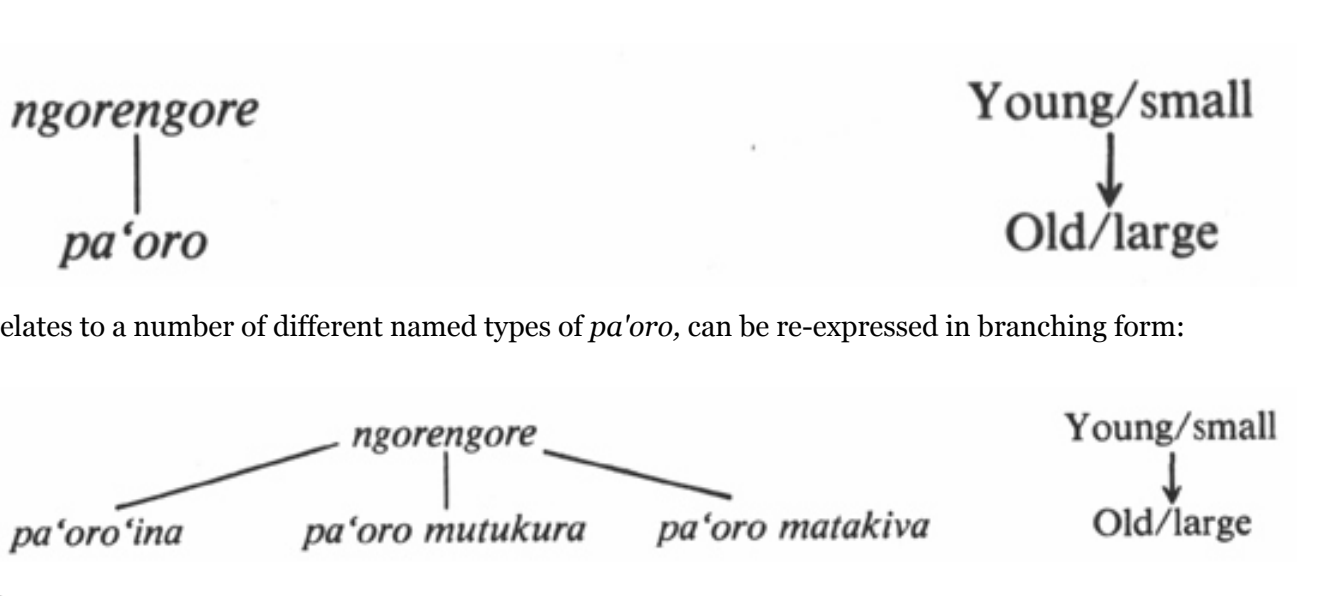
> Les polynésiens de l'ouest des Tuamotu estimant que les Scaridés et certains Labridés présentent des caractéristiques communes . . . , les considèrent comme "apparentés" *feti'i,* "descendant" d'un même groupe des petits poissons les *pitika* ou *patika*. . . . Cette classification est effectivement considérée comme une généalogie ainsi qu'en témoigne l'expression *tuataparara'a te i'a* "retracer les connexions généalogiques des poissons" (Ottino and Plessis 1972:362).

Here there is a more marked difference from Mangaian modes of explanation. I was not made aware of any connection between genealogy (*'akapapa'anga*) and life-stages. For Mangaians the commonest ways of indicating the relationship of a younger stage, X, to an older stage, Y, are statements of the types:

- 1. "When X is mature (*me pakari*) it will be a Y"
- 2. "When X is big (*me mama'ata, me ngangao*) it will be a Y"
- 3. "X will become (*Ka riro* X *ei* . .) a Y"
- 4. "From X 'comes down' (*'eke rai*) Y".

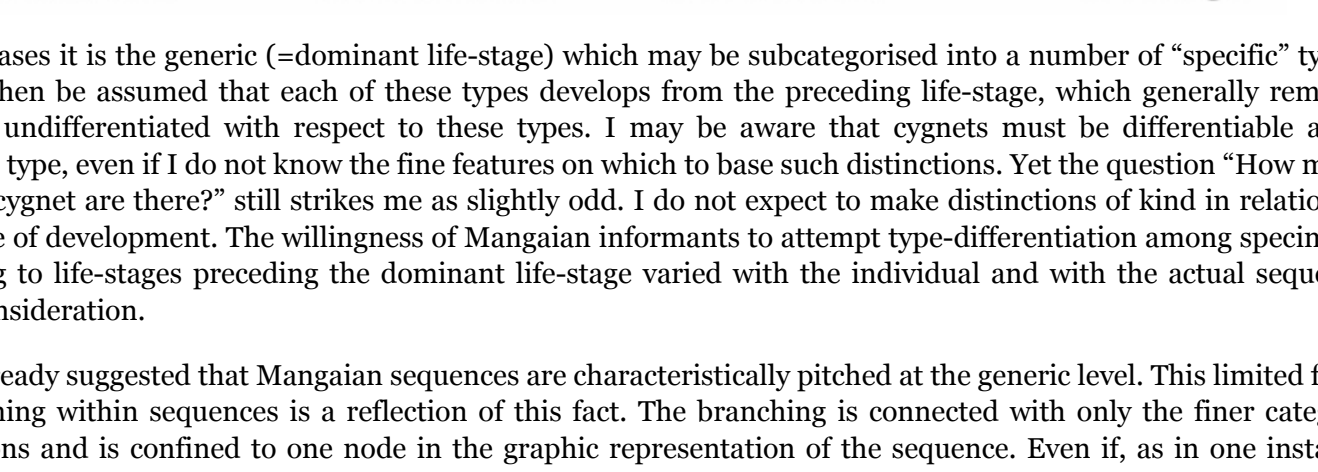
All of which are rather literal expressions of the understood processes of growth and development.

The use of a genealogical model in the Tuamotu group but not on Mangaia seems to be associated with actual differences in the structure of their life-stage sequences, and in the way that these are linked to the broader pattern of animal classification. The parrot-fish and wrasse sequences described for Rangiroa combine to form a repeatedly branching structure, closely resembling a genealogical tree. Following Ottino and Plessis we have (1972:362, 369):

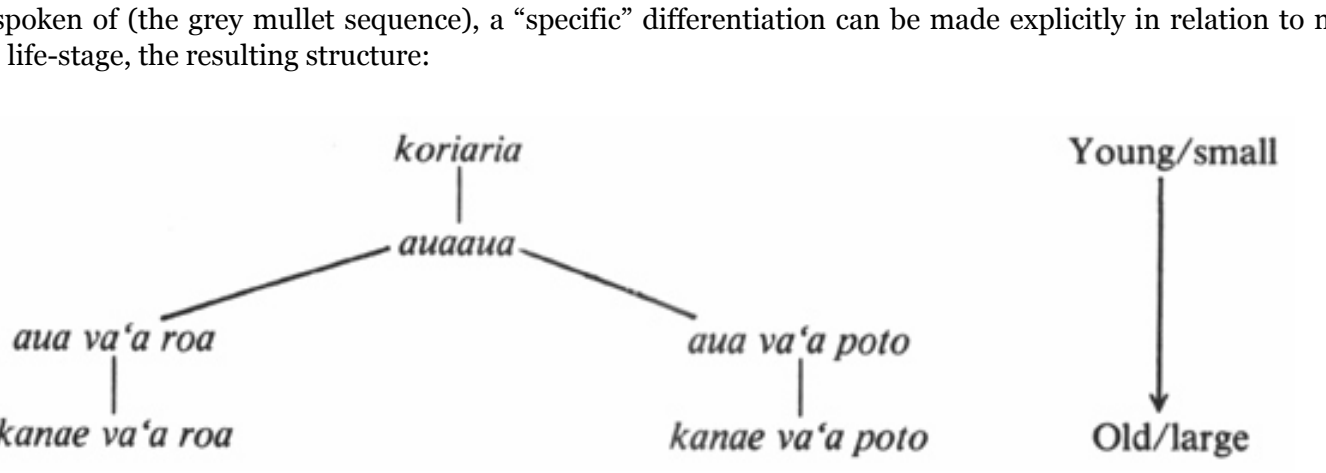


Several different sequences can be traced from the same initial life-stage, the different outcomes of the separate lines of development being a group of fish seen as similar and related.

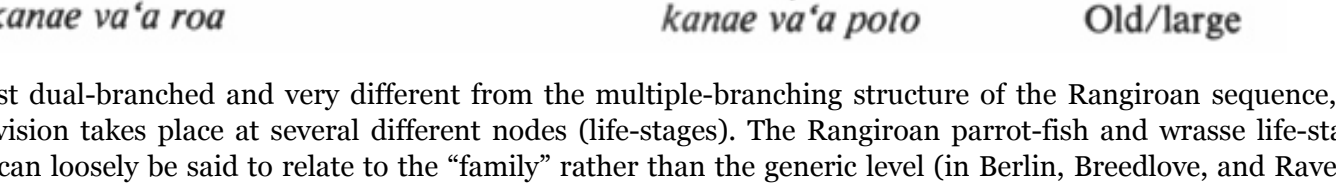
In contrast, Mangaian sequences tend to be unilinear. For example, though the trevallies *titiara* and *ru'i* are considered similar and related, we have a pair of unbranching sequences:



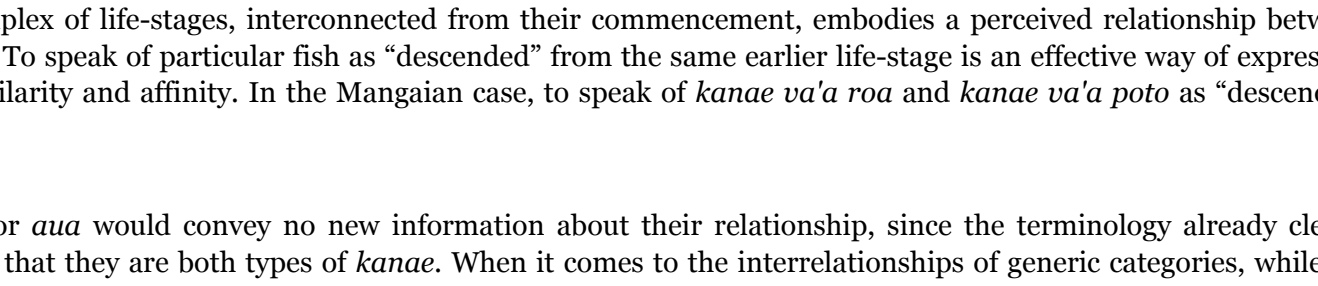
A Mangaian sequence such as that for the larger wrasses of genus *Thalassoma:*



since it relates to a number of different named types of *pa'oro,* can be re-expressed in branching form:

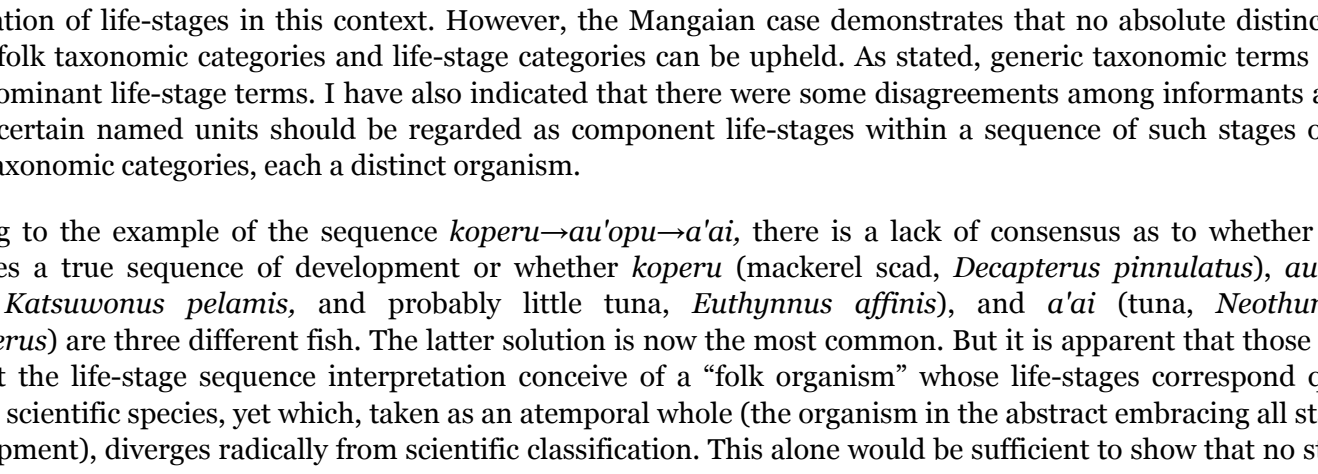


This is analogous to putting the life-stage sequence cygnet→swan in the form:



In both cases it is the generic (=dominant life-stage) which may be subcategorised into a number of "specific" types. It must then be assumed that each of these types develops from the preceding life-stage, which generally remains (overtly) undifferentiated with respect to these types. I may be aware that cygnets must be differentiable as to "specific" type, even if I do not know the fine features on which to base such distinctions. Yet the question "How many kinds of cygnet are there?" still strikes me as slightly odd. I do not expect to make distinctions of kind in relation to that stage of development. The willingness of Mangaian informants to attempt type-differentiation among specimens belonging to life-stages preceding the dominant life-stage varied with the individual and with the actual sequence under consideration.

I have already suggested that Mangaian sequences are characteristically pitched at the generic level. This limited form of branching within sequences is a reflection of this fact. The branching is connected with only the finer category distinctions and is confined to one node in the graphic representation of the sequence. Even if, as in one instance already spoken of (the grey mullet sequence), a "specific" differentiation can be made explicitly in relation to more than one life-stage, the resulting structure:



is still just dual-branched and very different from the multiple-branching structure of the Rangiroan sequence, in which division takes place at several different nodes (life-stages). The Rangiroan parrot-fish and wrasse life-stage complex can loosely be said to relate to the "family" rather than the generic level (in Berlin, Breedlove, and Raven's terms it relates to a covert intermediate taxon between the level of the generics and that of the "fish" life-form taxon). This complex of life-stages, interconnected from their commencement, embodies a perceived relationship between generics. To speak of particular fish as "descended" from the same earlier life-stage is an effective way of expressing their similarity and affinity. In the Mangaian case, to speak of *kanae va'a roa* and *kanae va'a poto* as "descended" from *auaaua* or *aua* would convey no new information about their relationship, since the terminology already clearly indicates that they are both types of *kanae*. When it comes to the interrelationships of generic categories, while the people of Rangiroa have, in their converging life-stage sequences, developed their own version of the old biological equation of ontogeny and phylogeny, Mangaians handle these in terms of parallel life-stage sequences, each stage being related similarly to its counterpart in another sequence (e.g., for the two trevally sequences reproduced above one might state *riporipo:pararu'i::titiara:ru'i*). "Family" relationships are external to the life-stage classification.

Life-stages and Scientific Taxonomy

The extent of correspondence between folk and scientific classifications has been a persistent issue in ethnozoological studies. Central to these studies is the question of the degree to which different classifications can be seen as comparable responses to similarly perceived natural discontinuities. The lack of strict parallels in scientific classification for sequences of named life-stages relating to a single organism has, no doubt, discouraged the consideration of life-stages in this context. However, the Mangaian case demonstrates that no absolute distinction between folk taxonomic categories and life-stage categories can be upheld. As stated, generic taxonomic terms may also be dominant life-stage terms. I have also indicated that there were some disagreements among informants as to whether certain named units should be regarded as component life-stages within a sequence of such stages or as generic taxonomic categories, each a distinct organism.

Returning to the example of the sequence *koperu→au'opu→a'ai,* there is a lack of consensus as to whether this constitutes a true sequence of development or whether *koperu* (mackerel scad, *Decapterus pinnulatus*), *au'opu* (bonito, *Katsuwonus pelamis,* and probably little tuna, *Euthynnus affinis*), and *a'ai* (tuna, *Neothunnus macropterus*) are three different fish. The latter solution is now the most common. But it is apparent that those who do accept the life-stage sequence interpretation conceive of a "folk organism" whose life-stages correspond quite closely to scientific species, yet which, taken as an atemporal whole (the organism in the abstract embracing all stages of development), diverges radically from scientific classification. This alone would be sufficient to show that no study of the correspondence between Mangaian and scientific biological categories could afford to ignore life-stages.

Berlin, Breedlove and Raven (1966, 1973) have spoken of the divergence of a folk-biological category from a scientific category (primarily the species) in terms of "over-differentiation" and "under-differentiation", where an over-differentiated category represents a subdivision of a species and an under-differentiated category embraces more than one species. (The folk categories considered are, of course, of a level of inclusiveness at which species correspondence is a real probability, whether this is the level of the "terminal taxon", as assumed in the earlier writings of Berlin and his colleagues, or that of their "folk-generic taxa", as suggested in later works.) A case can be made for the association of life-stage sequencing with both over- and under-differentiation.

When Mangaians speak of a single scientific species by a number of different life-stage names, this is clearly not a case of over-differentiation as it is normally understood. A single organism is involved, both in the scientific and the Mangaian conception. The life-stages are not distinct kinds of animal but different states of a single kind. Yet, in so far as some life-stage sequences constitute a systematic subdivision of a species into named units on the basis of dimensions or features not invoked in the scientific classification, they raise questions about the relation of classification to its objects very similar to those raised by taxonomic over-differentiation.

I noted in an earlier section that not all Mangaian life-stage sequences could be said to reflect major developmental changes in body structure or coloration. When first coming to consider the variety of terms applied to fishes, I was struck by the fact that, whereas a number of similar but observably distinct (in colour, patterning, and the details of body form) species might be spoken of by the same, unqualified Mangaian term (informants simply noting that "there are many kinds of X"), other fishes all belonging to the same species, and differing bodily only in a few centimetres of growth, might be divided into categories spoken of by quite different terms. For example, Mangaian fish terminology does not distinguish between at least four, and probably several more, species of butterfly-fish (Chaetodontidae), even though these species differ markedly in coloration and patterning. They are all simply *ti'iti'i*. Yet, at the same time, there is a sequence of named life-stages such as:

raupipi→tiotio→tiotio nanue→nanue

which relates to the stages of development of a rudder-fish (*Kyphosus* sp.) up to a maximum growth of about 45 cm in length. Changes in the coloring and body form of the fish are minimal. In terms of physical appearance, these life-stages are little more than growth-stages. The scalar nature of these discriminations was reflected in inconsistencies in the attribution of specimens to stages. If I say that *raupipi* covers fish up to 20 cm in length, *tiotio* those up to about 33 cm, *tiotio nanue* those up to 40 cm, and *nanue* the fish above this size, that is a fair average reflection of my informants' statements. But this should not disguise the fact that one man's large *raupipi* can be another's small *tiotio,* or that individual judgments might vary. Without definite morphological features on which to base discrimination, and short of introducing some standardised set of life-stage measures, this is, of course, inevitable. At any rate, what we see in these two instances is a remarkable contrast between the lack of terms distinguishing species readily differentiable on sight due to striking features of coloration, and the existence of terms to differentiate subtle, fuzzily-bounded size gradations within a single species. Such a pattern of naming can hardly be seen simply in terms of response to perceived natural discontinuity.

Hunn (1976, 1977) has made an important distinction between deductively generated and inductively generated categories. He explains:

> Deduction generates categories a priori by the statement of a defining rule. Such categories are known by reference to a set of defining features . . . the defining features of deductive categories must be linguistically codable in order to be communicated without direct reference to examples of the category. . . . Inductive categories must be created by abstracting a configuration from a sample of the membership of the category. No defining rule is given . . . the characteristic configurations of inductive categories are entities unique to each category. (Hunn 1977:46.)

The configurations arrived at by inductive processes are said to be "concrete features", having gestalt qualities (e.g. "swan-ness" could be said to be the characteristic, unanalysed configuration by virtue of which a swan is instantly recognisable). Inductive categories, Hunn proposes, form the core of a folk biological classification, they reflect natural discontinuities, and they correspond closely to scientific taxa. The rules used in defining a category by deduction may, however, result in category boundaries which cut across inductively defined units. Such rule-bounded categories which pick on particular features or dimensions are less likely to show correspondence to the taxa of scientific biology.

On first consideration, it is tempting to assume that the folk organism, which embraces a complete set of life-stages, is first established by induction, and that the separate life-stages are subsequently established by a deductive process. The rules invoked in the deductive definition of life-stage categories would clearly involve size, but size considerations might be interconnected with considerations of behaviour and habitat. For the case of the rudder-fish, just cited, this seems a credible proposal. In this instance there is obviously a need for some set of rules which stands apart from the perceptions of overall similarity and so can isolate discrete units within the continuum of gradual growth and development. (Why it should be desirable to distinguish particular units will be a question discussed in the next section.) However, it is obviously the case that not all life-stage categories are generated by deduction. Where there is a greater physical distinctiveness of life-stages there is no reason to assume that inductive life-stages could not come into being. For instance, the idea that separate configurations are generated for "swan" and "cygnet" is considerably more credible than the proposition that swans and cygnets are only differentiated by certain defining rules. It is also worth noting that, in many instances, if the inductively derived configuration characteristic of an organism was a configuration shared by all its life-stages, this would be such an impoverished configuration that the distinction between organisms would be lost. Consider the categorisation of parrot-fishes and wrasses on Rangiroa, described in the last section. The first life-stage, *pitika,* is shared by a number of sequences. If it is assumed that the *pitika* of each sequence share a certain configuration with the other stages of that sequence, and since *pitika* of all sequences are grouped together on the basis of their overall similarity, the shared configuration can hardly be characteristic of any one sequence. What we appear to be seeing here are not folk organisms predefined by induction, whose life-stages are then isolated, but rather a number of independently generated categories being integrated into life-stage sequences. (This integration may still, of course, rest upon inductive processes, whether the recognition of a general similarity between all sequence members, or a stronger adjudged similarity between successive stages.

Particular resemblances between adjacent stages would help underwrite the unity of a sequence by the creation of something analogous to the "chain complex" of Vygotsky 1962:64.)

This leads on to the question of how it is possible to distinguish between a group of similar organisms of differing maximum size and the life-stages of a single organism. There are many possible answers to this. There may be an observable relationship between larger and smaller individuals which can be interpreted as parentage. It may be possible to observe intermediate forms, indicating a developmental continuum. The temporary, seasonal appearance of a smaller form may suggest that it is a juvenile. There may be an obvious overlap in the observed sizes of the exemplars of two forms, suggesting that they represent distinct organisms. And so on. However, the evidence available may be sufficiently sparse or inaccessible for either interpretation to be acceptable. In my discussion of the distribution of Mangaian life-stage sequences I have already outlined some circumstances in which more than one scientific species may be incorporated into a single life-stage sequence.

There are really two kinds of under-differentiation associated with life-stage sequences. The first is essentially similar to the kind of under-differentiation seen in taxonomic categories. This is the failure, or lack of concern, to distinguish between similar species within one or more life-stage category. One might take the example of the many species of small hermit crabs which are lumped together as *ungaunga*. It is the second variety of under-differentiation which relates to the problem of the identification of life-stages themselves. As in the example of the scads, bonito, and tuna with which I began this section, it is possible that certain scientific species or genera will be interpreted in the Mangaian categorisation not as distinct organisms but as life-stages. This type of life-stage-specific under-differentiation has distinctive theoretical implications.

One major point is that, even if it can be assumed that all human beings tend to recognise certain basic, inductively defined biological categories, employing assessments of the overall similarity of observed species, and that such inductive categories will tend to correspond to scientific taxa, differences between classifications will still arise through differences in the way that relationships between such categories are theorised. There is a temptation to assume that basic, inductively defined categories (identifiable, perhaps, with the untheorised "natural kinds" of Quine 1969) will necessarily be interpreted as corresponding to what I have loosely been calling "folk organisms". These folk organisms are abstract units which may be seen as making no reference to time or as having continuity through time. In the "folk organism" sense, a swan is a swan is a swan is a swan, whether the actual exemplar being considered is a cygnet or a fully-grown bird. The typical folk generic categories which feature so widely in the ethnozoological literature are conventionally read as folk organisms. But we have seen that the similarities and differences which in scientific terms might be interpreted by reference to degrees of separation in evolutionary history, or might in many folk models be seen in terms of different degrees of relatedness on a kinship analogy, can also, in some instances, be theorised as reflecting degrees of separation in the developmental process of a single creature. This reveals very clearly that there is no necessary identification between basic inductive categories and folk organisms. Given appropriate understandings about the nature and extent of developmental change, several of the former may be incorporated within one of the latter.

This, clearly, does not accord with the initial hypothesis that life-stages could be seen as deductive subdivisions of an inductively derived category. It is now apparent that life-stages of a single organism, may be established either by induction or deduction. It seems reasonable to suggest that the Mangaian life-stage sequence incorporating half-beaks, needle-fish and swordfish depends upon deductive links — some kind of bony elongation of the jaws being a feature stressed as common to all.

It is evidently possible for human beings (and other animals) to act consistently towards objects in their world on the basis of untheorised judgments of similarity, an evolutionary heritage (Quine 1969). There may well be primitive "natural kinds" underlying all human classifications and accounting for many cross-cultural similarities. Yet the biological classifications shared (to a greater or lesser extent) by the people of any culture are also exercises in the theorisation of similarity. A true conception of organism involves the recognition of at least two dimensions of similarity, one of which reflects the sequence of development. The non-correspondence between some Mangaian and scientific organisms (the life-stage related under-differentiation) rests, as I have said, on different interpretations of similarity — the intra-organism similarities existing between different stages of development *versus* the inter-organism similarities resulting from evolutionary relationships or parallel evolution.

Substantial discussion of the theorisation of similarity in the creation of classifications is beyond my present scope. Yet it is a vital link between primitive inductive category-formation and higher-order representations. Since that gap between basic cognitive function and the Durkheimean realm of representations has so often come to anthropological attention, it does seem remarkable that the theorisation of similarity has received so little consideration. Many questions remain to be answered. Are there "natural" or universal theories of similarity? It does seem almost impossible to conceive of a biological classification without an interpretation of similarity in terms of developmental relationships. How much do theories of similarity rest upon social experience? Interpretation of similarity in terms of kinship is pervasive and, of course, intimately connected with the Durkheimean vision. What range of theories of similarity exists in human cultures? Other possible approaches to similarity do immediately come to mind — those based on analogy with human intention and design, the "God's plan" interpretation; those based on the outcome of comparable processes or ways of life, the "parallel evolution" interpretation, etc. But, with early emphasis in the study of "folk classification" upon the general classificatory structure or on the isolation of dimensions of similarity (components of meaning), and with later emphases on category formation and the internal structuring of categories, few social sciences have given any extensive attention to the ways in which similarity is read. (One obvious exception is Foucault's (1970) discussion of the forms of resemblance found in medieval and renaissance thought.) The descriptive base for comparisons is thin. I am now very aware of the limitations of my own field research in this area.

Consideration of life-stages can also lead to questions about the adequacy of our general models of folk classification. Most models of animal classification appear tacitly, to assume adult forms as the objects of classification. For instance, Hunn's (1976) "perceptual" model takes as its starting points "percepts of organisms". The clustering of these in "perceptual space" is the basis for the formation of inductive categories. A brief reflection is sufficient to realise that the inclusion of percepts of juveniles (at least, among some groups of animals) would greatly complicate this model, perhaps to the point of breakdown. As is reflected in the Rangiroa parrot-fish and wrasse classification, it is quite often the case that juveniles of separate but closely related species are much less obviously distinct than their adult forms. Indeed, as the Rangiroan response indicates, on the basis of simple, direct observation they may seem more similar to each other than to their respective adults. There would therefore be a tendency for the percepts of juveniles of related species to group together, bridging, as it were, the gaps between the adult percept clusters. It would be unlikely, in such a case, that the conditions that Hunn specifies for the emergence of inductive taxa would be met, in such a way that individual organisms were identified. (A requirement of pre-taxon identification in Hunn's model is that the dissimilarity between any two percepts within the cluster identified as a pre-taxon is less than the dissimilarity between any member percept and any nonmember.) This suggests that, for realism, the model either requires more sophisticated clustering measures or that mechanisms should be specified by which percepts of juveniles are pre-identified, weighted against, or otherwise removed from consideration. Again, it is easy enough to throw up ideas about why or how adult forms might be favoured over juveniles in the creation of general classifications. For many species the sheer bulk of sightings will probably favour adults and in terms of human-animal interactions adults will take precedence. For some kinds of animal, apparently inbuilt responses to the proportions of body parts (the "cute response" — see Jolly 1972:227-8) may be significant in identifying juveniles. Given observation over time, the greater stability of the adult form may be detected, as well as the periodic appearance of juveniles. But, whatever the factors involved, they clearly do not guarantee for all cases and all cultures identical assessments of development. It cannot be assumed that the juveniles and adults of any species will be automatically incorporated in the same "folk organism".

Once more, the anthropological contribution here looks rather thin. If anthropologists have tended to gloss over the assessments of development of organisms in the belief that they are somehow obvious or given to observation, I hope I have indicated that this is not the case. Neither is it the case that questions about the assessment of development are only relevant to cases of life-stage classification. The example of Hunn's perceptual model indicates the need to understand how an interpretation of developmental process fits in with the broader categorisation of distinctive kinds. This is equally true for attribute-based models of classification or those which stress the prototypical image. (How are juvenile and adult forms related to the general category prototype?) It would seem to be time to take the cue from Boas, and for future research to give more attention to developmental sequence.

Why Life-stages?

Granted that some interpretation of the developmental relationships between the exemplars of organisms is probably essential to any general classification of those organisms, there is still the question of what promotes the establishment of named sets of life-stages.

To speak here in terms of the universal human impulse to classify is not particularly helpful. Even if the identification of life-stages is part of a general human enterprise of imposing order on experience, the problem of accounting for the distribution of named life-stage sequences remains.

In accounting for particular sequences, some authors have stressed the physical difference between life-stages. So Barnett (1978:57) remarks:

> Many fish undergo dramatic physical changes with growth. Juvenile fish are not little copies of the adult form. Changes occur in shape, colouration, behaviour, and size. These growth stages are recognised and named by Solomon Islanders.

But the Mangaian data clearly indicate that morphological differences alone are not sufficient to account for the differentiation of named life-stages. Consideration of the distribution of sequences in relation to the complete Mangaian fauna reveals that those creatures for which named life-stage sequences do exist are not necessarily those with the most marked developmental changes in form.

If, then, the generation of such sequences is not a passive or automatic response to physical discontinuity, we need to consider more precisely the circumstances in which this kind of classification might have specific (practical) significance for its users. In his study of the ethnoichthyology of the Hong Kong Boat People, Anderson (1972:64) suggests a relationship between fish life-stage categories and the sorting of fish by age and size for sale. In a commercial setting such as that of Hong Kong, the determination of age-stages may be directly connected with the determination of expected prices. Life-stage sequences, then, take on economic significance. But Mangaian fish sequences (and those of many other Pacific societies) did not develop in a market context. Sale of fish is a relatively modern phenomenon, and restricted in scale. None the less, the distribution of catches between fishermen, and by fishermen to others, is very much a traditional conclusion of fishing activities. Indeed, Mangaian myth connects the origins of counting with the first reckoning of a fish catch. Certainly, life-stage terminology is used in discussing and assessing catches. If one man describes his catch as "three *riporipo* (juvenile *Caranx* sp.)" and another describes his as "three *titiara* (mature *Caranx* sp.)", it can automatically be assumed that the second has the superior catch without any further description of the fish. Or, if a man were to distribute *titiara* to his fishing companions while keeping only fish which might be described as "*riporipo*" for himself, this would be an act of great generosity (stupidity, his immediate family might say). Though the immediate distribution of a catch is, and presumably has always been, very much a matter of making visual judgments from the actual specimens there in front of you (creating visually roughly equivalent groups, or whatever), it is certainly possible that some life-stage terminology has developed in connection with the "accountancy" of sharing and reciprocity.

I am inclined to believe that it is at the "discussion of catch" stage that compound intermediate terms such as *riporipo titiara* arise. Though such intermediate compound forms were given in the verbal life-stage catalogues of some informants, their principal use is in the description of actual specimens. The fuzziness of the boundaries between life-stages is probably at its most obvious when you have lying on the shoreline rocks in front of you a particular fish in a range of sizes (as when the catch comes from several different schools of different stages of development). As suggested earlier, the compound terms do not so much relate to distinct life-stage categories as act as a means of dealing with this fuzziness. By identifying a fish as *riporipo titiara*, you acknowledge that it is neither truly a *riporipo* nor truly a *titiara*. This neatly overcomes the difficulty of determining the boundary between these two categories and avoids possible disagreements. (Since *riporipo titiara* is not constituted as a category in the same way, its boundaries are not a problem.) The compound terms are, then, a way of speaking about what you actually have "in your hand", fitting it to the framework of categories. However, in speaking of intentions or plans of action, compound terms are unlikely to be used. A fisherman will tell you that he hopes to catch *titiara* or that he has chosen bait and hooks suitable for *riporipo*. A *riporipo titiara* is something you know you may catch and will know when you have it, but it is not something your activity is directly focused towards. Rosch, in discussing the way in which the terms applied to different categories fit into typical descriptions of activity, has spoken of the role of objects as "props for events" (Rosch and Lloyd 1978:43). In these terms, *riporipo titiara* acts as a prop for a narrower range of events than either *riporipo* or *titiara*.

This said, we can see that many life-stage categories can act as a focus for activity in hunting, fishing or gathering. In attempting to understand their origins, it is necessary to move from the "fish in the hand" to the "fish in the water". With the exception of the insects, all the recorded Mangaian life-stage sequences relate to creatures taken for food and/or bait. (Even the lice are animals which are, in a sense, hunted.) In the seeking out and taking of animals, differences in habitat and behaviour, particularly behaviour relative to particular methods of capture, become all-important. One approach to life-stages is to see them as a sort of shorthand for such differences arising in the course of an animal's development. For instance, Akimichi (1978:311) writes of Lau (Solomon Is.) ethnoichthyology:

> In connection with the daily change-over of fish, it is recognised that the feeding habits change according to the life-cycle stages of fish. Briefly, smaller fish inhabit lagoons, feeding in the daytime. As they become older, a drastic shift in feeding habits occurs in terms of time and space; large fish inhabit deeper water and feed at night. Some fish live and feed on coral when they are young and, subsequently, live among rocks when they reach adult stage.

This local lore is reflected in the terminology, some fish having two or more names according to their developmental stages. . . .

Johannes, in his recent study of Palau fishing (Johannes 1981:126) makes a similar but more general point:

> . . . a species which is very important to Pacific islanders may have a variety of names, often corresponding to different size classes. In most cases it is recognised that these different names refer to the same fish. But the different sizes are distinguished taxonomically because of their different habits or habitats or the different fishing techniques used to catch them. . . . In Palau, for example, the milkfish, *Chanos chanos*, is called *chaol* when it is small and lives in brackish mangrove ponds. After growing larger it moves out onto the reef to live over sandy bottoms and is now called *meseketat*. (Most Palauan fishermen are aware that the two names refer to different stages in the life history of the same species.)

Mangaian informants also made it clear that the use of life-stage terms often entails a knowledge which goes well beyond size-grading or morphological description. When a Mangaian fisherman tells another fisherman what he intends to fish for, he knows that this triggers expectations about when, where, and how the fish will be caught. The behaviour-related implications generally vary according to life-stage. For many species the later life-stages will not venture into the shallower water of the lagoon (the drowned reef flat), or, if they do enter it, will only do so for relatively short periods when the tide is high. Those who net the channels through the reef ridge during the falling tide recognise a lagoon-leaving sequence of different fish and their life-stages. The line fishermen also need to consider life-stage divisions. Not only because of differences in habitat, and the obvious need for different hook sizes, but also because differences in feeding habits may mean that different baits are desirable. For instance, one informant listed his preferred baits for successive trevally stages: *riporipo* — small rock-pool hermit crabs and small fish bait such as blennies; *titiara* and *kiko muri* — progressively larger fish bait, such as scad, and (less common now) hooks with pearl-shell lure; *urua* — large fish bait, small eels and octopus. Many similar instances could be given of the practical implications of behaviourally-based distinctions between life-stages.

Obviously, no single explanation can be given for all cases of explicit life-stage sequencing. In general, the way in which life-stage names are used on Mangaia appears to favour an interpretation in terms of behavioural distinctions relevant to the location and taking of the creatures involved. But this does not rule out a role for the recognition of morphological discontinuities, and size grading for catch distribution and exchange may, equally, have played a part. Nor do all life-stage names necessarily refer to equivalent categories. I have already suggested that the compound intermediate terms can scarcely be said to represent distinct life-stage categories (or, at least, that the distinctions that they do represent have a rather narrow range of relevance). The same might be claimed for some (though by no means all) of the diminutives formed by reduplication. Of course, where domesticated animals are involved there are other areas of relevance for life-stage terminology — one, since breeding is often a prime aim, being the degree of sexual maturity. There were no native Mangaian domesticates. However, it is interesting to note that Mangaians now have terms such as *tangutu* (sexually immature animal), *rapa 'ou* (unmated female), and *manga toa* (sexually immature male), which are applied principally to pigs, but also to other introduced domesticates.

Just why, when continuous observation of development is not possible and there are considerable morphological and behavioural differences between the creatures observed, a life-stage interpretation may be preferred to an interpretation in terms of separate organisms (sometimes to the extent of fusing different scientific species), is an interesting general question. One possible conclusion is that it represents a cognitive economy, not so much in terms of numbers of categories (after all, you either have the category of organism or the life-stage category), but in terms of the interpretational or theoretical back-up which the categories require, and of the simplification of their interrelationships. In addition, one might ask whether such differences in categorisation reflect different expectations concerning the extent of knowledge of organisms, or of the world in general. While having a category corresponding to an organism merely implies a knowledge of the existence of that organism, a sequence of life-stage categories implies a wider knowledge of its life-history. Where the whole course of development is not readily observable (as with eels or many oceanic fish), there may be an inclination to complete the sequence by the fusion of different but similar species of differing size ranges. The strength of this inclination would vary with the expectation of the completeness of knowledge. (Do the people of a society accept that, even with a familiar organism, there may be periods and aspects of its life which are outside their observation, or do they expect the observed world to be relatively complete in its information?) This, in turn, might reflect the degree of diversity experienced in the social and physical environment. On this argument, a formerly rather isolated island community such as that of Mangaia without, before the 19th century, experience of either radically contrasting social forms or of any great variety of natural environment, might be expected to try and create a fairly comprehensive set of interpretations of their natural world based on their available observations. The creation of life-stage sequences would be one aspect of this.

APPENDIX: MANGAIAN FISH LIFE-STAGE SEQUENCES

- 1. *Fresh-water eels* (Anguillidae)
- *kavere* (a)→*tuna* (b)
- (a) *Anguilla* spp. to 25 cm.
- (b) above 25 cm.

- 2. *Conger eels and pearlfishes* (Congridae, Carapidae)
- *toketoke pu'i* (a)→*pu'i* (b)→*?mamaru* (c)
- (a) *Carapus* sp. to about 20 cm.
- (b) *Conger cinereus* to about 1 m.
- (c) to 2 m + . NB: *mamaru* is a rare and rather mysterious eel-like fish, probably not a conger.

- 3. *Halfbeaks, garfish and swordfish* (Beloniformes, Istiophoridae, Xiphiidae)
- *miromiro* (a)→*kakukaku* (b)→*kaku* (c)→*'akura* (d)
- OR
- *miromiro*→*kakukaku*→*'aku* (e)→*'akura*
- (a) Halfbeak (*Hemiramphidae*) to about 40 cm.
- (b) Needlefish (*Belonidae*) to about 60 cm.
- (c) Wahoo (*Acanthocybium solandri*) to about 1.2 m.
- (d) Swordfish (*Xiphiidae, Istiophoridae*)
- (e) Needlefish (*Tylosurus* sp.?) to about 1.2 m.

- 4. *Flying fish* (Exocoetidae)
- *koipa* (a)→*maroro* (b)
- (a) *Cypselurus* sp.(?) and possibly *Parexocoetus* sp. to about 18 cm.
- (b) *Cypselurus* sp.(?) to about 30 cm.

- 5. *Soldierfish* (Holocentridae)
- *kuku* (a)→*ku* (b)
- (a) *Holocentrus* and *Myripristis* spp. to about 13 cm.
- (b) over 13 cm.
- *ku taraea* (a)→*ku ta* (b)
- (a) *Holocentrus* spp. to about 17 cm.
- (b) *Holocentrus spinifer* to about 30 cm.

- 6. *Barracudas* (Sphyraenidae)
- *onoono* (a)→*ono* (b)
- (a) *Sphyraena* sp. to about 80 cm.
- (b) to 2 m +.

- 7. *Grey mullets* (Mugilidae)
- *koriaria* (a)→*auaaua* (b)→*aua* (c)→*aua kanae* (d)→*kanae* (e)

- (a) to about 7 cm.
- (b) to about 12 cm.
- (c) 12-20 cm.
- (d) 20-30 cm.
- (e) to about 50 cm.
- This sequence covers several species of Mugilidae including *Crenimugil* sp. and the smaller *Neomyxus chaptalli*, which is an *aua* at full size.

- 8. *Threadfin* (Polynemidae)
- *paramoi* (a)→*moi* (b)
- (a) *Polydactylus sexfilis* to about 20 cm.
- (b) to about 40 cm.

- 9. *Tunas, bonitos and scads* (Thunnidae, Katsuwonidae and Carangidae)
- *au'opu* (a)→*a'ai* (b)
- (a) Bonito (*Katsuwonus* sp.) and little tuna (*Euthynnus* sp.) to about 90 cm.
- (b) Tunas (*Neothunnus macropterus*) and others to about 2 m.
- *koperu* (a)→*au'opu*→*a'ai otava* (b)
- (a) Mackerel scad (*Decapterus* sp.) to about 30 cm.
- (b) Yellowfin tuna (*Neothunnus macropterus*)
- *ature* (a)→*orare* (b)→*au'opu*→*a'ai to 'everi* (c)
- (a) Silver scad (*Selar* sp.) to about 20 cm.
- (b) Silver scad to 30 cm.
- (c) Germon (*Thunnus ?alalunga*)

- 10. *Snake mackerels* (Gempylidae)
- *tavere manga* (a)→*manga*
- Principally *Promethichthys prometheus* — (a) to about 30 cm.

- 11. *Castor oil fish* (*Ruvettus pretiosus*)
- *kuravena* (a)→*vena* (b)
- (a) to about 1 m.
- (b) to about 1.5 m.

- 12. *Silver scads* (Carangidae) See (9) for alternative sequence.
- *ature* (a)→*orare* (b)
- OR
- *ature*→*orare*→*nato* (c)
- (a) *Selar crumenophthalmus* to about 20 cm.
- (b) to about 30 cm.
- (c) *Caranx ?sexfasciatus* to about 1 m.

- 13. *Black trevally* (Carangidae)
- *pararu'i* (a)→*ru'i* (b)→*ru'i kai'ara* (c)→*ru'i urua* (d)
- This sequence relates to the development of *Caranx lugubris.*
- (a) to about 18 cm.
- (b) to about 40 cm.
- (c) to about 90 cm.
- (d) over 90 cm.

- 14. *Blue trevally and others* (Carangidae)
- *riporipo* (a)→*riporipo titiara* (b)→*titiara* (c)→*kikomuri* (d)→ *urua* (e)

- This sequence relates to a number of *Caranx* spp., principally *C. melampygus,* with some smaller Carangoides included in the early stages.
- (a) to about 18 cm.
- (b) to about 30 cm.
- (c) to about 45 cm.
- (d) to about 90 cm.
- (e) over 90 cm.

- 15. *Barred flagtails* (Kuhliidae)
- *a'ore'ore* (a)→*a'ore* (b)
- (a) *Kuhlia taeniura* to about 10 cm.
- (b) to about 20 cm.

- 16. *Silver flagtails* (Kuhliidae)
- *aputuputu* (a)→*aputu* (b)
- (a) *Kuhlia ?marginata* to about 10 cm.
- (b) to about 20 cm.

- 17. *Brown groupers or sea basses* (Serranidae)
- *karakarau*(a)→*karau*(b)→*karau va'ava'a*(c)→*va'ava'a*(d)→*tarao*(e)→*tonu*(f)
- Early stages are chiefly *Epinephelus hexagonatus/merra,* middle stages probably involve *E. tauvina,* while the final stage is almost certainly the Giant Jewfish, *Promicrops lanceolatus.*
- (a) to about 15 cm.
- (b) to 30 cm.
- (c) to about 40 cm.
- (d) to about 55 cm.
- (e) 1 m.
- (f) to 2 m +.

- 18. *Lunar-tailed rock cod* (Serranidae)
- *taratara* (a)→*taratara oka* (b)→*oka* (c)
- (a) to about 28 cm.
- (b) to about 42 cm.
- (c) to about 65 cm.
- All stages are *Variola louti.*

- 19. *Blue-lined sea perch, black spot snapper, red snapper* (Lutjanidae)
- *morenga* (a)→*tangao* (b)→*angamea* (c)
- (a) to about 30 cm.
- (b) to about 70 cm.
- (c) to about 90 cm.
- This is a much-debated sequence, different informants accepting one or other life-stage link, accepting both or rejecting both. The species *Lutjanus kasmira, L. monostigma, L. bohar* and at least one other *Lutjanus* sp. are probably overlapped to create the sequence.

- 20. *Golden-lined sea perch and jobfish* (Lutjanidae)
- *tutae auri* (a)→*tavatava* (b)→*puru* (c)
- (a) *Gnathodentex* sp. to about 30 cm.
- (b) *Aphareus* sp. to 45 cm.

- (c) ?*Aphareus* sp. over 60 cm.
- Another controversial sequence. Some of the most experienced fishermen regard these as three separate fish.

- 21. *Surmullets* (Mullidae)
- *ka'uru'uru* (a)→*ka'uru* (b)→*a'uru* (c)
- (a) to about 12 cm.
- (b) to about 25 cm.
- (c) to 30 cm +.
- The whole sequence relates to a number of *Parupeneus* spp., and possibly some *Upeneus* and *Mulloidichthys* spp.

- 22. *Bait goatfish* (Mullidae)
- *koama* (a)→*koama vete* (b)→*vete* (c)
- (a) to about 13 cm.
- (b) to about 20 cm.
- (c) to about 35 cm.
- The sequence applies as a whole to *Mulloidichthys samoensis* and possibly *M. vanicolensis.*

- 23. *Golden-banded goatfish* (Mullidae)
- *takua* (a)→*takua paparu* (b)→*paru* (c)
- (a) to about 30 cm.
- (b) to about 45 cm.
- (c) to about 60 cm.
- This sequence is probably created by the overlap of *Mulloidichthys auriflamma* with a larger deep-water *Mulloidichthys* sp.

- 24. *Rudder-fish* (Kyphosidae)
- *raupipi* (a)→*tiotio* (b)→*tiotio nanue* (c)→*nanue* (d)
- (a) to about 20 cm.
- (b) to about 33 cm.
- (c) to about 40 cm.
- (d) to about 45 cm.
- The whole sequence applies to *Kyphosus cinearescens* and probably a second *Kyphosus* sp.

- 25. *Fire, puzzle and purple wrasses* (Labridae)
- *ngorengore* (a)→*pa'oro* (b)
- (a) to about 10 cm.
- (b) to 30 cm.
- The sequence applies to *Thalassoma fuscum, T. umbrostigma* and *T. purpureum.*

- 26. *Petroleum parrotfish* (Scaridae)
- *pau'uu'u* (a)→*pau'u* (b)
- (a) *?Leptoscarus vaigensis,* to about 15 cm.
- (b) to about 30 cm.

- 27. *Lined rabbitfish* (Siganidae)
- *piriri* (a)→*maemae* (b)
- (a) *Siganus spinus* to about 8 cm.

- (b) to about 25 cm.

- 28. *Spotted rabbitfish* (Siganidae)
- *ka'o* (a)→*morava* (b)
- (a) *Siganus rostratus,* to about 8 cm.
- (b) to about 30 cm.

- 29. *Surgeonfish* (Acanthuridae)
- *pio* (a)→*papara'a* (b)→*para'a* (c)→*'api* (d)
- (a) to about 7 cm.
- (b) to 12 cm.
- (c) to about 16 cm.
- (d) to about 30 cm.
- The sequence applies as a whole to many Surgeonfish spp., including *Ctenochaetus striatus, Acanthurus achilles, A. olivaceus, A. guttatus, A. aliala.*

- 30. *Convict tangs* (Acanthuridae)
- *koninonino* (a)→(*'io'iovi*)→*titiovi* (b)→*tiovi* (c)→*avini*
- (a) to about 7 cm.
- (b) to about 11 cm.
- (c) to about 25 cm.
- The whole sequence relates to *Acanthurus triostegus.* The term *'io'iovi* is little used, the distinction being almost too subtle to be useful. *Avini* is an archaic term for large *tiovi,* heard principally in the context of legend.

- 31. *Unicornfish* (Acanthuridae)
- *umeume* (a)→*ume* (b)
- (a) to about 20 cm.
- (b) to about 60 cm.
- The sequence relates to at least two *Naso* spp., *N. unicornis* and *N. lituratus.*

- 32. *Fresh-water gudgeon* (Eleotridae)
- *kokopu* (a)→*patu* (b)
- (a) *Eleotris* sp., to about 16 cm.
- (b) to 20 cm +
- *Patu* is another archaic life-stage form, heard only in accounts of traditional history.

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